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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 1745 Examiner: Tracy Mae Dove

Serial No. 10/649,244 Filed: August 27, 2003

In re Application of: Richard D. Breault

For: FUEL CELL TEMPERATURE CONTROL BY EVAPORATIVE COOLING

DECLARATION OF GREGORY REYNOLDS

Commissioner for Patents
Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Greg Reynolds, hereby declare and state as follows:

1. This Declaration is being submitted by Gregory Reynolds having a residence at 127 Skyline Drive South Windsor Connecticut, 06074.

2. I hold a B.S. in Mechanical Engineering from the University of Rhode Island. I am currently employed by the assignee of the above-identified patent application. I have been an active full time participant in the field of fuel cells and fuel cell related systems for over 35 years. Practitioners regard me as an expert in the fuel cell industry regarding fuel cell stacks and fuel cell operation. Because of my education and experience, I believe myself to be a person skilled in the art in fuel cell systems and design.

3. I am familiar with the above referenced patent application including the claims.

4. I have read and understand the presently outstanding Office Action in the above-identified patent application, mailed September 6, 2006.

5. I have read and understand the cited prior art reference of Stedman et al. (US Patent No. 3,704,172).

6. The Stedman et al. reference describes a dual mode power system in which open-cycle operation is employed for short duration peak power periods and a closed cycle mode is employed for long duration base power periods (Stedman et al. at col. 1, lines 21-27).

7. The Stedman et al. reference describes that in open cycle mode heat is removed by the evaporation of the diluent and vented to atmosphere (Stedman et al. at col. 1, lines 60-68).

8. The Stedman et al. reference describes an evaporative cooling means 30 having a liquid inlet 32 and a vapor outlet 34 for open cycle mode operation cooling (Stedman et al. at col. 2, lines 70-72).

9. The Stedman et al. reference describes a pressure relief means 36 which may be a pressure relief valve, is disposed in the vapor outlet 34 (Stedman et al. at col. 3, lines 1-2).

10. The Stedman et al. reference depicts in the figure the pressure relief valve 36 downstream of the vapor outlet 34.

11. The Stedman et al. figure depicts the vapor outlet 34 in communication with the upstream liquid inlet 32 as part of the evaporative cooling means 30.

12. The Stedman et al. figure depicts an open ended pipeline downstream of the pressure relief valve 36. Thus, the steam from the evaporative cooling means 30 flowing into and through the vapor outlet 34 and then through the pressure relief means 36 is discharged directly out to atmosphere.

13. There is no other apparatus or device coupled downstream of the pressure relief valve 36, of the Stedman et al. reference.

14. The Stedman et al. reference describes a control means 70 operatively connected to first pressure sensing means 72 in the vapor outlet of the evaporative cooling means 30 (Stedman et al. at col. 3, lines 57-59).

15. The Stedman et al. reference further describes that the control

means 70 is operatively connected to second pressure sensing means 74 in the conduit 66 and is operatively connected to valve means 68 for regulating the valve means 68 to maintain a predetermined pressure differential between the vapor outlet 34 and the coolant liquid in the conduit 66. (Stedman et al. at col. 3, lines 60-64).

16. The Stedman et al. reference is silent with respect to describing drawing a vacuum in second channels formed between the transport plate of the adjacent cell and the other side of the barrier layer to reduce the pressure in the second channels to below the vapor pressure of the water in the first channels to cause the liquid water to boil and produce steam that passes through the barrier layer into the second channels, as is claimed in part in claim 16.

17. It is well understood in the fuel cells art that a pressure relief valve does not create or draw a vacuum for fluids upstream of the pressure relief valve. A pressure relief valve has a higher pressure upstream of the valve and typically a lower pressure downstream of the valve.

18. Based on what is described in Stedman et al. and the lack of disclosure of Stedman et al. coupled with the basic understanding of the operation of pressure relief valves, one of ordinary skill in the art would not conclude that the Stedman et al. reference discloses drawing a vacuum in second channels formed between the transport plate of the adjacent cell and the other side of the barrier layer to reduce the pressure in the second channels to below the vapor pressure of the water in the first channels to cause the liquid water to boil and produce steam that passes through the barrier layer into the second channels, as is claimed in part in claim 16.

19. The Stedman et al. reference does not disclose flowing liquid water into and through the water flow channel and out of the fuel cell, the water being heated within the water channel by heat produced by the fuel cell; causing the liquid water to boil as it flows through the water channel by reducing the pressure in the steam channel below the vapor pressure of the flowing liquid water to convert at least some of the water to steam that passes through the barrier layer

into the steam channel, wherein the pressure in the steam channel is increased or decreased during cell operation in response to the operating temperature of the cell to increase or decrease the operating temperature of the cell to achieve a desired cell operating temperature; and condensing the steam outside the fuel cell and recirculating a portion of the condensed steam back to the flowing liquid water, wherein the steam originated as the flowing liquid water converted into steam and passed through the barrier layer into the steam channel, as is claimed in part in Claim 12.

20. The Stedman et al. reference undoubtedly depicts the steam from the evaporative cooling means 30 piped through the vapor outlet 34 to discharge to atmosphere through the pressure relief valve 36. The steam from the evaporative cooling means 30 never flows to a radiator, or a condenser or an accumulator or any other device after flowing through the vapor outlet 34 and pressure relief means 36.

21. I further declare that all statements made of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity or enforceability of a patent issued from this patent application.

1/8/07 Gregory Reynolds

Date